PB-218 684

EMISSION REPORT ON THE TSURUMI TRADING COMPANY MANIFOLD

John C. Thomson, et al

Environmental Protection Agency
Ann Arbor, Michigan

February 1972

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

PB 218 684 72-15

APTD-1399

Emission Report on the Tsurumi Trading Co. Manifold

February 1972

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of C
Springfield

John C. Thomson
Test & Evaluation Branch

Revised
by

Henry L. Compf
Test & Evaluation Branch
Environmental Protection Agency

BIBLIOGRAPHIC DATA SHEET	1. Report No. APTD-1399	2.	3. Recipient's Accession No. PB-218 684
4. Title and Subtitle Emission Report on the Tsurumi Trading Co. Manifold			5. Report Date February 1972 6.
7. Author(s) John C. Thomason (Revised by Henry L. Gompf)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address ENVIRONMENTAL PROTECTION AGENCY Test and Evaluation Branch Ann Arbor, Michigan			10. Project/Task/Work Unit No. 11. Contract/Grant No.
12. Sponsoring Organization Name and Address Same			13. Type of Report & Period Covered Inhouse 14.

15. Supplementary Notes

16. Abstracts On the basis of locally obtained test results, Tsurumi Trading Company, Ltd. of Japan, requested emission tests on a device they had developed. Basically the Tsurumi system provides a method for preheating the air-fuel mixture prior to combustion. A new manifold was designed which involved enclosing the intake manifold in the exhaust manifold forming a heat exchanger arrangement. Additional air is supplied to the intake manifold through the use of an air valve installation below the carburetor. The test vehicle was a Nissan Cedric with a six cylinder engine and manual transmission. For these tests the vehicle choke was disconnected. Three different fuels were used for these tests. The test program consisted of a series of 1975 Federal Test Procedure emission tests. Conclusions indicate that this modified engine system does not appear to be a likely candidate for future application. Any significant emission reduction would require considerably more control over the air-fuel ratio and probably a catalytic converter.

17. Key Words and Document Analysis. 17a. Descriptors

Air pollution
Exhaust emissions
Manifolds
Tests
Standards
Vehicles

17b. Identifiers/Open-Ended Terms

Tsurumi manifold
Federal Test Procedure (1975)
Constant Volume Sampling Technique

17c. COSATI Field/Group 13B

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Unlimited	UNCLASSIFIED	5
	20. Security Class (This Page) UNCLASSIFIED	22. Price 3.00

Background

On the basis of locally obtained test results, Tsurumi Trading Company, Ltd. of Japan, requested emission tests on a device they had developed. A commitment to test was made by EPA and arrangements for vehicle delivery were made. The vehicle was delivered in late August 1971, for testing.

Device

Basically the Tsurumi system provides a method for preheating the air-fuel mixture prior to combustion. A new manifold was designed which involved enclosing the intake manifold in the exhaust manifold forming a heat exchanger arrangement. Additional air is supplied to the intake manifold through the use of an air valve installation below the carburetor. This new arrangement was designed to minimize unequal distribution to the cylinders and provide more efficient combustion. In addition, the engine compression ratio could be slightly lowered by the installation of a spark plug spacer. The vehicle was tested using three different types of fuels.

Test Program

For this test series a vehicle was supplied by Tsurumi. This vehicle was a Nissan Cedric with a six cylinder engine and manual transmission. For these tests the vehicle choke was disconnected. Three different fuels were used for these tests. Fuel #1 was a mixture of kerosene, toluene, and gasoline, while fuel #2 was a mix of 30% kerosene and 70% toluene. The third fuel was Indolene 30.

The test program consisted of a series of 1975 Federal Test Procedure emission tests as described in the July 2, 1971, Federal Register. This test employs a constant volume sampling system. Because of probable hang-up of the heavy hydrocarbons in tests using fuels #1 and #2, the hydrocarbon results reported are probably lower than the actual value that would be determined if continuous sampling and a heated flame ionization detector were used. Carbon monoxide and carbon dioxide were measured from the sample bag using non-dispersive infrared analyzers. Oxides of nitrogen were measured using a chemiluminescence detector.

Results

The test results are reported in the Appendix and are separated according to fuel used (Table I). The first test on gasoline was run with no changes in the engine settings. The second test with gasoline was with raised compression and optimized for gasoline. For reference, the Federal standards for 1976 are listed at the bottom of the table. During these tests, starting was difficult and the vehicle seemed to be quite sensitive to starting procedure.

Conclusions

This modified engine system does not appear to be a likely candidate for future application. Any significant emission reduction would require considerably more control over the air-fuel ratio and probably a catalytic converter.

Table 1

Test Results from Tsurumi Cedric Vehicle
Using 1975 Test Procedure
(All Results in Grams Per Mile)

Fuel Used	Date	HC	CO	CO_2	NOx
#2	8-30-71	6.2	37	551	3.3
#1	8-31-71	5.2	33	593	4.1
Gasoline	9-1-71	3.1	33	503	2.4
Gasoline	9-2-71	4.6	26	475	5.5
Federal Standards for 1976		0.41	3.4	---	0.4